[1039]

CLAIMS

1. A method of creating a high resistivity material on a target, comprising

directing a focused ion beam toward an impact point on the target; and

directing one or more precursor gases toward the impact point, the ion beam causing the precursor gas to decompose and thereby deposit a high resistivity material onto the target.

2. The method of claim 1 in which the one or more precursor gases comprises a first precursor compound that when applied alone to a target in the presence of an ion beam decomposes in the present of the ion beam to produce a conductive material and a second precursor compound that when applied alone to a target in the presence of an ion beam decomposes in the presence of the ion beam to product an insulating material.

3. The method of claim 1 in which the high resistivity material has a resistivity of between about $5x10^4$ ohms per square and about $7x10^4$ ohms per square.

4. The method of claim 2 in which the first precursor compound includes an organometallic compound.

5. The method of claim 4 in which the first precursor compound includes a platinum or tungsten organometallic compound.

6. The method of claim 2 in which the second precursor compound deposits a compound containing silicon.

7. The method of claim 6 in which the second precursor compound includes a siloxane compound.

8. The method of claim 6 in which the second precursor compound includes OMCTS or TMCTS.

9. The method of claim 1 in which the high resistivity material deposited on the target forms a structure and in which the structure has a resistance of less than 900 megohms.

10. The method of claim 1 in which the high resistivity material deposited on the target forms a structure and in which the structure has a resistance of between one megohm and 100 megohms.

11. The method of claim 1 in which directing a focused ion beam onto the target includes directing the focused ion beam to deposit a high resistivity structure having a length of less than 500 μm and a resistance of greater than 0.5 megohm.

12. A method for creating a high resistance structure on a target, comprising the steps of:

providing a first precursor compound and a second precursor compound in the presence of a focused ion beam;

causing the deposition of a structure onto the target wherein the presence of the first and second precursor compounds cause the structure to exhibit a high resistivity.

13. The method of claim 12, wherein the resistance of the structure is controllable by controlling the length or width of the structure.

14. The method of claim 12, wherein the rate of deposition is controllable according to the relative concentrations of the first and second precursor compounds.

15. The method of claim 12, wherein the high resistance structure exhibits an interface layer between a conductive layer and a non-conductive layer.

16. The method of claim 12, wherein the high resistance structure exhibits a linear voltage-current relationship over a voltage range of greater than 10 volts.

17. The method of claim 12 in which the structure has a resistance as measured by both the two point and four point probe methods of between one megohm and 900 megohms.

18. The method of claim 12 in which the structure has a resistance as measured by both the two point and four point probe methods of between one megohm and 100 megohms.

19. A charged particle beam system comprising:

a vacuum chamber;

a source of a charged particles within the vacuum chamber;

a focusing device for focusing the charged particles into a beam for bombarding a specimen;

one or more sources of one or more precursor gases, the one or more precursor gases being gases that when decomposed by the charged particle beam deposit a conductive material having a high resistivity.

20. The system of claim 19 in which the one or more sources of one or more precursor gases comprises a source of an insulator precursor compound and a source of a conductor precursor compound.

21. The system of claim 19 in which the source of the one or more sources of one or more precursor gases comprises a source of a siloxane compound and a source of an organometallic compound.

22. The system of claim 19 in which the one or more sources of one or more precursor gase includes a source of a precursor gas or gases that deposit a material having a resistivity of between about 5 $x10^4$ ohms per square and about 7 $x10^4$ ohms per square.

23. The system of claim 19 in which the one or more sources of one or more precursor gases includes a source of a precursor gas or gases suitable for depositing a microscopic structure having a resistance of between 1 megohm and 100 megohms.

24. A microscopic, high resistivity structure on an electronic substrate comprising metal atoms and silicon atoms, exhibiting a resistance of between 0.5 megohm and 900 megohms, and deposited by focused ion beam assisted deposition.

25. The structure of claim 24 in which the resistance of the structure is between 3 megohms and 100 megohms.

26. The structure of claim 24 in which the resistivity of the material comprising the structure is between about 5 $x10^4$ ohms per square and about 7 $x10^4$ ohms per square.

27. The structure of claim 24 in which the metal atoms include tungsten or platinum atoms.

28. The structure of claim 24 in which the high resistivity structure has a contact resistance of between about one and about two megohms.

29. The structure of claim 24 in which the high resistivity structure has a length of less than 100 microns.

30. The structure of claim 24 in which the high resistivity structure has a length of less than 1000 microns.